



INVESTIGATOR'S ANNUAL REPORT

United States Department of the Interior
National Park Service

All or some of the information you provide may become available to the public.

OMB # (1024-0236)
Exp. Date (11/30/2010)
Form No. (10-226)

Reporting Year: 2008	Park: Shenandoah NP	Select the type of permit this report addresses: Scientific Study	
Name of principal investigator or responsible official: Damon Ely		Office Phone: 540-231-6679	
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Additional investigators or key field assistants (first name, last name, office phone, office email) Name: Herbert Maurice Valett Phone: 540-231-2065 Email: mvalett@vt.edu			
Project Title (maximum 300 characters): Increased acidity and nitrogen availability in Appalachian streams: interactive effects on nitrogen spiraling			
Park-assigned Study or Activity #: SHEN-00335	Park-assigned Permit #: SHEN-2008-SCI-0003	Permit Start Date: Feb 12, 2008	Permit Expiration Date: Feb 11, 2009
Scientific Study Starting Date: Feb 12, 2008		Estimated Scientific Study Ending Date: Feb 11, 2009	
For either a Scientific Study or a Science Education Activity, the status is: Continuing		For a Scientific Study that is completed, please check each of the following that applies: <input type="checkbox"/> A final report has been provided to the park or will be provided to the park within the next two years <input type="checkbox"/> Copies of field notes, data files, photos, or other study records, as agreed, have been provided to the park <input type="checkbox"/> All collected and retained specimens have been cataloged into the NPS catalog system and NPS has processed loan agreements as needed	
Activity Type: Research			
Subject/Discipline: Water Quality			

Purpose of Scientific Study or Science Education Activity during the reporting year (maximum 4000 characters):

The purpose of the study is to understand how acid deposition may impair algal and microbial-driven in-stream processes of energy flow and nitrogen cycling, impairments which become apparent at the ecosystem scale with chronic stream acidification. The effects of stream acidity on community structure are most often reported with little emphasis on functional impairment. The proposed research will be the first to investigate the role of pH and associated factors on nitrogen processing, which is a valuable stream ecosystem service that may be impaired due to decades of anthropogenically-induced acidic precipitation. Long-term watershed acidification research has taken place at Shenandoah National Park and this proposal seeks to build on the existing knowledge base by increasing our understanding of whole-system effects on stream function within the park. Please see the attached proposal for a comprehensive explanation of the overall purpose and specific objectives of the study.

Findings and status of Scientific Study or accomplishments of Science Education Activity during the reporting year (maximum 4000 characters):

We found large declines in ecosystem respiration with increasing acidity in these streams. These declines coincided with decreased fungal biomass and published findings of slower leaf decomposition rates in other acidified streams. When standardized by fungal

biomass to reflect carbon-use efficiency, specific respiration was much higher in acidic streams indicating stress effects at the ecosystem level. Areal rates of nitrogen uptake did not appear to vary with stream pH, however, there was a slight increase with acidity when N uptake was standardized by fungal biomass, similar to our previous findings in laboratory microcosms. We also found that the biomass-specific activities of certain exoenzymes were greater in leaf biofilms from more acidic streams. These results suggest that 1) acidification is an ecosystem-level stressor with consequences for ecosystem respiration, and 2) the fate of N uptake may differ in stressed conditions, i.e., instead of allocation to growth, N uptake may be enhanced for the production of extracellular exoenzymes required to compensate for carbon loss due to higher respiration rates.

For Scientific Studies (not Science Education Activities), were any specimens collected and removed from the park but not destroyed during analysis? No	
Funding specifically used in this park this reporting year that was provided by NPS (enter dollar amount): \$0	Funding specifically used in this park this reporting year that was provided by all other sources (enter dollar amount): \$4000
List any other U.S. Government Agencies supporting this study or activity and the funding each provided this reporting year: 	

Paperwork Reduction Act Statement: A federal agency may not conduct or sponsor, and a person is not required to respond to a collection of information unless it displays a valid OMB control number. Public reporting for this collection of information is estimated to average 1.625 hours per response, including the time for reviewing instructions, gathering and maintaining data, and completing and reviewing the forms. Direct comments regarding this burden estimate or any aspect of this form to Dr. John G. Dennis, Natural Resources (3127 MIB), National Park Service, 1849 C Street, N.W., Washington, DC 20240.